

PATENT COOPERATION TREATY
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Article 12, Rules of practice 56)

(PCT Article 36 and PCT Rule 70)

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| Applicant's or agent's file reference: 16-537 | | See Form PCT/IPEA/416 for further action. | |
| International application No. PCT/JP2004/017979 | International filing date (day/month/year) 26. 11. 2004 | Priority date (day/month/year) 02. 12. 2003 | |
| International Patent Classification (IPC) or national classification and IPC Int.Cl.⁷ G01N31/00, 21/77, 21/78, 31/22 | | | |
| Applicant Yoichi YAMAKAWA | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u> 3 </u> sheets including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> a total of <u> 8 </u> sheets (11 sheets in the English version), as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No.I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of the invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under PCT Article 35(2) with regard to novelty, inventive step or industrial applicability: citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | |

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| Date of submission of the demand 01. 07. 2005 | Date of completion of this report 01. 12. 2005 |
| Name and mailing address of the IPEA/JP Facsimile No. | Authorized officer Telephone No. |

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/017979

I. Basis of the report

1. With regard to the language, this report is based on the following language.

☒ the language in which the international application was filed.☐ This report is based on translations from the original language into the following language _____, which is language of a translation furnished for the purpose of:

- ☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4).
☐ international preliminary examination (under Rules 55.2 and/or 55.3).

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

☐ The international application as originally filed/furnished☒ the description:pages 1, 6, 8, 10, 11 (1 to 3, 7, 10 to 12, 14 to 17, 19 to 23 in the English version), as originally filed/furnished
pages* 2 to 5, 7, 9 (4 to 6/1, 8 to 9/1, 13, 18 in the English version), received by this Authority on
September 29, 2005

pages* _____, received by this Authority on _____

☒ the claims:

Nos. _____, as originally filed/furnished

Nos.* _____, as amended (together with any statement) under Article 19

Nos.* 1, 3 to 5, received by this Authority on September 29, 2005

Nos.* _____, received by this Authority on _____

☒ the drawings:pages _____ 1 to 4, as originally filed/furnished

pages* _____, received by this Authority on _____

pages* _____, received by this Authority on _____

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.3. ☒ The amendments have resulted in the cancellation of:☐ the description, pages _____☒ the claims, No. 2☐ the drawings, sheets/fig _____☐ the sequence listing (specify): _____☐ any table(s) related to sequence listing (specify): _____4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c))☐ the description, pages _____☐ the claims, Nos. _____☐ the drawings, sheets/fig _____☐ the sequence listing (specify): _____☐ any table(s) related to sequence listing (specify): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/017979

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|------------------|-----|
| Novelty (N) | Claims 1, 3 to 5 | Yes |
| | Claims | No |
| Inventive step (IS) | Claims 1, 3 to 5 | Yes |
| | Claims | No |
| Industrial applicability (IA) | Claims 1, 3 to 5 | Yes |
| | Claim | No |

2. Citations and explanations (PCT Rule 70.7)

Document 1: JP 2000-107551 A (Oe Kagaku Kogyo Kabushiki Kaisha) 18 April, 2000 describes that a humidity detecting tape 4 for respectively detecting different humidity is attached to a surface of a packaging member 7, a perforated film 6 is covered so that the humidity detecting tape 4 cannot directly get in touch with an article to be conserved, and an air layer 9 is provided in a surface of the packaging member excluding a seal portion 3a (Fig.3).

Document 2: JP 1-69951 A (Ekika Tansan Kabushiki Kaisha) 15 March, 1989 describes an indicator which has a base member impregnated with a reagent and is partially or totally covered by a plastic thin film to be completely blocked off the outside.

Document 3: JP63-48455 A (Dainippon Printing Co., Ltd.) 01 March, 1988 describes that an antistatic layer is provided in at least a portion of a region other than a testing reagent portion in a test piece.

Document 4: JP6-43155 A (Miles Inc.) 18 February, 1994 & EP 449017 A & CA 2038167 A & US 5238737 A describe that a testing piece for diagnosing is subjected to antistatic finishing.

Claims 1 and 3 to 5:

In the invention according to Claim 1, the first and second films are formed to protrude from an outer peripheral edge of the humidity-determining plate and bonded at outer peripheral edge portions thereof directly to each other; and the first and second films are bonded in a compression manner to a portion of the humidity-determining plate surrounding a region corresponding to the air layer. With this structure, the generation of dust from a cut face of the outer periphery of the base paper sheet B can be prevented to minimize the generation of dust and minimize the diffusion of dust from the small holes of the film.

It appears that the above-described structure is neither described nor suggested in any of the above-described Documents.

an outer surface or a cut face of such paper. When the dust adheres to an electronic part, there is a possibility that the performance of the electronic part may be influenced. Therefore, it is desirable to prevent the dust generated from the base paper sheet from being diffused to the outside.

Further, there is a possibility that when another part or a packaging material in a charged state is brought near to the electronic part, the performance of the electronic part may be influenced and moreover, dust is liable to adhere to the part or the like in the charged state by a static electricity. Therefore, it is desirable that the humidity indicator itself is hard to be charged with electricity as much as possible in view of avoiding the influence of electrostatic charge and the influence of the dust.

The present invention has been accomplished with the above-described circumstances in view, and it is an object of the present invention to solve the above-described conventional problems in a simple structure.

MEANS FOR SOLUTION OF THE PROBLEMS

To achieve the above object, according to a first feature of the present invention, there is provided a humidity indicator, comprising at least one humidity-determining face which is provided on a surface of a humidity-determining plate comprising cobalt chloride held in a base paper sheet, so that the cobalt chloride is exposed to the humidity-determining face, whereby humidity is determined by the discoloration of the cobalt

chloride on the humidity-determining face, characterized in that the humidity indicator further includes a first film covering the surface of the humidity-determining plate and forming the surface of the humidity indicator, and a second
5 film covering the back of the humidity-determining plate and forming the back of the humidity indicator; a flat air layer is formed at least between the first film and the surface of the humidity-determining plate, so that the entire surface of the humidity-determining face faces to the air layer; a plurality
10 of small holes are formed at distances from one another in the first film to permit the direct communication of the air layer with the atmosphere; the first and second films are formed to protrude from an outer peripheral edge of the humidity-determining plate and bonded at outer peripheral edge
15 portions thereof directly to each other; and the first and second films are bonded in a compression manner to a portion of the humidity-determining plate surrounding a region corresponding to the air layer.

According to a second feature of the present invention,
20 in addition to the first feature, a plurality of the humidity-determining faces are arranged at distances on the surface of the humidity-determining plate in correspondence to a plurality of different humidity levels, respectively, and the air layer is formed commonly to the plurality of
25 humidity-determining faces.

According to a third feature of the present invention,

in addition to the first or second feature, the base paper sheet is a filter paper having a hygroscopicity; a flat second air layer is formed between the second film and the back of the humidity-determining plate, so that at least a region or regions of the back corresponding to the humidity-determining face or faces face to the second air layer; and a plurality of small holes are formed at distances from one another in the second film to permit the direct communication of the second air layer with the atmosphere.

According to a fourth feature of the present invention, in addition to any of the first to third features, each of the films has been subjected to an antistatic treatment.

EFFECT OF THE INVENTION

As described above, with each of the first to fourth features of the present invention, the surface and back of the humidity-determining plate are covered with the first and second films. Therefore, even if an operator directly picks the humidity indicator with his or her hand, the cobalt chloride on the humidity-determining face can be prevented effectively from adhering to the hand and thus, entering into the operator's body, and the operator can handle the humidity indicator without anxiety. In addition, the humidity indicator is of such a structure that even if fine dust (such as paper scraps and fiber) is generated from the base paper sheet of the humidity indicator, it is blocked off each of the films and hard to be diffused to the outside. Therefore, even if the humidity

indicator is sealedly accommodated along with electronic parts and the like adversely affected by dust, the influence of dust to the electric parts can be prevented effectively.

operation is hard to conduct. However, according to the present invention, the air layer is interposed between the small holes and the humidity-determining faces and hence, not only the portions corresponding to the small holes but also the entire
5 surfaces of the humidity-determining faces can be discolored uniformly, and thus, such problem can be eliminated.

Additionally, the first and second films are formed to protrude from the outer peripheral edge of the humidity-determining plate, and bonded at their outer peripheral
10 edges directly to each other. Therefore, the outer peripheral edge of the base paper sheet can be covered completely with the first and second films and hence, it is possible to reliably prevent the generation of dust from a cut face of the outer periphery of the base paper sheet. In addition, because the
15 films are bonded directly to each other, it is possible to carry out the bonding operation relatively easily and reliably, leading to the simplification of the bonding step.

Further, since the first and second films are bonded in a compression manner to a portion of the humidity-determining
20 plate surrounding a region corresponding to the air layer, it is possible to minimize the diffusion of the dust generated from the base paper sheet to the outside.

Particularly, with the second feature of the present invention, a plurality of the humidity-determining faces are
25 arranged at the distances on the surface of the humidity-determining plate in correspondence to a plurality

of different humidity levels, and the air layer is formed commonly to the plurality of humidity-determining faces. Therefore, the step for forming the air layer is simplified, as compared with a case where air layers are formed for every humidity-determining
5 faces.

Particularly, with the third feature of the present invention, the base paper sheet of the humidity-determining plate is the filter paper having the hygroscopicity; the flat second air layer is formed between the second film and the back
10 of the humidity-determining plate, so that at least the region or regions of the back corresponding to the humidity-determining face or faces face to the second air layer; and the plurality of small holes are formed at distances from one another in the second film to permit the direct communication of the second
15 air layer with the atmosphere. Therefore, when the humidity indicator has been taken in the atmosphere out of a sealed storage container or the like, the humidity in the atmosphere is transmitted from the back side of the base paper sheet through the inside of the base paper sheet even to the surface-side
20 air layer. Accordingly, it is possible to more enhance the sensitivity of portions of the humidity-determining faces on the side of the surface to the change in humidity.

Particularly, with the fourth feature of the present invention, the films have been subjected to the antistatic
25 treatment and hence, the humidity-determining plate itself is hard to charge with electricity and moreover, it is hard for

dust to adhere to the films by static electricity. Thus, even if the humidity indicator is sealedly accommodated along with electronic parts, it is possible to avoid the influence of charging to the electronic parts and the influence of dust as

permeated into and held in the base paper sheet B. Thus, portions of the surface of the base paper sheet B corresponding to positions of dropping of the cobalt chloride solutions are the humidity-determining faces M1 to M4. Black bold lines L have
5 been printed in a proper shape (a quadrilateral shape in the illustrated embodiment) on the surface of the base paper sheet B for clearly indicating borders between the humidity-determining faces M1 to M4, while respectably hiding the permeation of the solutions into peripheral edges of the
10 portions, onto which the solutions have been dropped. Further, indications (5 %, 10 %, 20 % and 30 %) of limit humidity values capable of being checked by the humidity-determining faces M1 to M4 have been printed on or in the vicinity of the humidity-determining faces M1 to M4. The structure of the
15 humidity-determining plate P described above is conventionally well-known.

On the other hand, the cover member C is comprised of a first film F1 covering the surface of the humidity-determining plate P, and a second film F2 covering the back of the
20 humidity-determining plate P. The first and second films F1 and F2 are formed to protrude from an outer peripheral edge of the humidity-determining plate P and bonded at m at their peripheral edges F1a and F2a directly to each other, so that the entire resulting film assembly is formed into a flat
25 quadrilateral bag-shape.

Each of the films F1 and F2 is formed of a transparent

electronic parts E and a drying agent D in a transparent air-tight packaging bag DP, as illustrated in Fig.4 in the transportation of the electronic parts such as circuit boards adversely affected by moisture, and the electronic parts E are transported as
5 remaining contained in the packaging bag DP. A container provided with a lid for sealing may be used in place of such packaging bag.

During the transportation, whether or not the humidity in the packaging bag DP exceeds a defined limit can be visually
10 determined by the colors of the humidity-determining faces M1 to M4 of the humidity indicator I (based on whether or not the humidity-determining faces M1 to M4 have been discolored). Therefore, it is possible to easily check whether or not the inside of the packaging bag DP with the drying agent D contained
15 therein is kept in a proper humidity state (a dried state) during the transportation.

When the packaging bag DP is opened to remove the electronic parts E, the operator picks the humidity indicator I with his or her hand, takes it out of the packaging bag and checks the
20 colors of the humidity-determining faces M1 to M4. The surface and back of the humidity-determining plate P are covered with the first and second films F1 and F2 in the humidity indicator I of the present embodiment, and hence, even if the operator has picked the humidity indicator I directly with his or her
25 hand, it is possible to effectively prevent the cobalt chloride Co on the humidity-determining faces M1 to M4 from adhering

CLAIMS

1.(amended) A humidity indicator, comprising at least one humidity-determining face (M1 to M4) which is provided on a surface of a humidity-determining plate (P) comprising cobalt chloride (Co) held in a base paper sheet (B), so that the cobalt chloride (Co) is exposed to the humidity-determining face, whereby humidity is determined by the discoloration of the cobalt chloride (Co) on the humidity-determining face (M1 to M4), characterized in that

10 said humidity indicator further includes a first film (F1) covering the surface of said humidity-determining plate (P) and forming the surface of said humidity indicator, and a second film (F2) covering the back of said humidity-determining plate (P) and forming the back of said humidity indicator;

15 a flat air layer (Au) is formed at least between the first film (F1) and the surface of the humidity-determining plate (P), so that the entire surface of said humidity-determining face (M1 to M4) faces to said air layer (Au);

20 a plurality of small holes (H) are formed at distances from one another in said first film (F1) to permit the direct communication of said air layer (Au) with the atmosphere;

25 said first and second films (F1, F2) are formed to protrude from an outer peripheral edge of said humidity-determining plate (P) and bonded (m) at outer peripheral edge portions (F1a and F2a) thereof directly to each other; and

 said first and second films (F1, F2) are bonded in a

compression manner to a portion of said humidity-determining plate (P) surrounding a region corresponding to said air layer (Au).

2.(deleted)

5 3.(amended) The humidity indicator according to claim 1, wherein
a plurality of said humidity-determining faces (M1 to M4) are arranged at distances on the surface of said humidity-determining plate (P) in correspondence to a plurality of different humidity levels, respectively; and

10 said air layer (Au) is formed commonly to a plurality of said humidity-determining faces (M1 to M4).

4.(amended) The humidity indicator according to claim 1 or 3, wherein

15 said base paper sheet (B) is a filter paper having a hygroscopicity;

a flat second air layer (Ad) is formed between said second film (F2) and the back of said humidity-determining plate (P), so that at least a region or regions of said back corresponding to said humidity-determining face or faces (M1 to M4) face to
20 the second air layer (Ad); and

a plurality of small holes (H') are formed at distances from one another in said second film (F2) to permit the direct communication of said second air layer (Ad) with the atmosphere.

5.(amended) The humidity indicator according to claim 1, 3 or
25 4, wherein that each of said films (F1, F2) has been subjected to an antistatic treatment.